

Electrons or Cobalt?

R56-20

An Economic Comparison Between Electron Beam Generator and Cobalt-60 In Application to Production Runs in Food Sterilization or Chemical Treatment

IN deciding what type of source to use for food sterilization or chemical treatment, *kilowatt output* is an accepted yardstick.

Speaking conservatively, and not allowing for the relatively poor geometry (distribution) of the gamma-ray beam, about 200,000 curies of Cobalt 60 are required to produce the radiation power given by 1 kilowatt of electrons (and this applies only at the beginning; the ratio goes up as the Cobalt decays. Half-life: 5.3 years).

Users and prospective users of electron beam generators are currently thinking in terms of needing anywhere from 5 to 1,000 kw to accomplish their production needs. It thus requires 1,000,000 curies of Co-60 to equal the 5 kw output of *one* 1,000,000-volt Electron Beam Generator, or 2,000,000 curies to equal *one* 2,000,000 volt unit.

At the current cost of \$3-5 per curie for Co-60, any amount of Cobalt needed to do a production-type job in industry would have a fantastic cost — \$3,000,000 — \$5,000,000 to equal a single 1,000,000-volt EBG unit; \$6,000,000-\$10,000,000 to equal a 2,000,000-volt EBG. This, of course, does not take into account the fact that such huge quantities of radio-cobalt are not even available today. (Largest Cobalt source known to be in operation today is 5,000 curies. Most cancer therapy sources run around 600-1000 curies).

By comparison, electron beam generators currently available entail an initial purchase cost of \$63,500 to \$112,000 and cost about \$1 per kwh to operate. The huge cost differential between Cobalt-60 and electron beam generators is thus quite apparent, especially when one is considering production runs requiring high energies over long periods.

Cobalt is "on" all the time, hence if you operate only one 8-hour shift, you are wasting its energy during the other 16 hours, or 2/3 of the time. During this 16 hours, it is not only continuously operating, but is steadily decaying, or declining in energy output. Electron Beam Generators are on only when turned on. Many million-volt x-ray tubes, which have been in operation ever since the *mid-forties* and are similar to EBG tubes in design, are still going strong. The million-volt x-ray unit (well over 100 of which have been serving industry for years) is known as the "workhorse" of the metal-working x-ray inspection field.

The one major advantage of Cobalt —

its high penetration — is of importance in the case of thick or dense products, but may also prove a disadvantage in that so much of the beam can pass through the product and not be absorbed, thus requiring long exposures.

Irradiated Polyethylene Tape Used as Insulation By Motor Repair Shops

By
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Use of Irrathene® irradiated polyethylene tape as an insulation by motor repair shops is described in a brochure recently issued by General Electric Company's Chemical Development Department.

A special polyethylene which is rendered non-melting by electron bombardment, Irrathene offers high-temperature stability plus the excellent electrical and mechanical properties of conventional polyethylene.

Citing compatibility with other insulating materials, the new General Electric brochure describes use of Irrathene in a

complete insulation system. It can be used as a ground insulation on armature or field coils, as an encapsulation sealer tape over ground insulation on armature or field coils, and as a lead insulation.

Included in the brochure is a description of the special properties of the irradiated insulating tape. Its ability to encapsulate when heated provides a lasting seal against water, chemicals and dust, according to the brochure. In addition, Irrathene's non-melting characteristic is said to provide increased overload protection.

Entitled "Irrathene Irradiated Polyethylene Tape for Motor Repair Shops", the new brochure (CCD-1) is available from Chemical Development Department, General Electric Company, One Plastics Avenue, Pittsfield, Mass.

The Chemical Development Department is also producing, experimentally, plastic parts from irradiated carbon-black-filled polyethylene, known as Vulkene 107-E. The new material is a vulcanized reinforced polyethylene, black, tough and flexible, with physical properties superior to conventional high-pressure polyethylene. It can be carried to decomposition temperature without melting. At 300° F tensile strength is still 500 psi.

Higher-Powered Electron Beam Generators Announced by General Electric X-Ray

A major advancement has been made in providing electron generating machines at lowest cost per kilowatt with the announcement by General Electric's X-Ray Department, Milwaukee, Wis., of new models of the 1,000,000 and 2,000,000-volt resonant transformer Electron Beam Generators.

Higher Beam-Out Power: With a 6 ma beam-out rating, the 1 and 2 mev units deliver powers of **5 and 10 kw** respectively.

Wider Scanned Beams: Each model is available with either a 3" x 10" or a 3" x 5" tube. These dimensions refer to overall window size and the maximum useful beam widths at the window are 8" x 12" respectively. The 3" x 10" tubes carry a 3 ma beam-out rating and 6 ma for the larger size. All tubes have a standard warranty of 1,000 hours or 1 year's possession.

Console Control: The new control mounts on a desk or table and contains

operator's controls for voltage, current and scan adjustment. Relays, stabilizers and non-operating controls are contained in a separate, free-standing cabinet.

Stabilized, Independent Voltage and Current Control: Voltage and current can now be adjusted independently of one another. Stabilizers hold the current and voltage to within 1% of the set values. Further, the voltage and current can be pre-set and once the equipment is energized, it will automatically rise to operating level, thus requiring minimum operator attention and skill.

Low Cost per Kilowatt Output: Electron power is now available in the range of \$11,000 to \$13,000 per kw.

Tube costs with the 1,000-hour warranty, have been cut to just slightly over \$1 per kilowatt hour. It is anticipated that tubes will considerably outlast the warranty period, thus bringing costs well below this figure.